What Explains the Dispersion Effect?
Evidence from Exogenous Variation in Institutional Ownership

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Abstract

This paper offers a joint test of two plausible explanations (difference-in-opinion vs. analyst self-censoring) for why stocks with higher dispersion in analysts' earnings forecasts earn lower subsequent returns (the dispersion effect). We recognize the possibility that institutional ownership can be endogenous, which could cause bias in the tests of the dispersion effect. We address this concern by exploiting the exogenous variations in institutional ownership generated by the annual reconstitution of the Russell 3000 index. We find that in the general sample, firms with higher institutional ownership have a weaker dispersion effect, but the exact opposite is true for firms in the Russell sample. Furthermore, we find parallel results when we replace stock returns with analyst forecast bias. These results strongly suggest that analyst self-censoring rather than the more popular difference-in-opinion story is the more plausible explanation for the dispersion effect, at least in a sample where the endogeneity bias of institutional ownership is minimized.

1. Introduction

The dispersion effect refers to the intriguing anomaly in asset pricing studies first documented in Diether, Malloy and Scherbina (henceforth DMS) (2002) in which stocks that have higher dispersion in analysts' earnings forecasts – and hence are presumably riskier – earn lower future returns. DMS (2002) propose two plausible explanations to account for the dispersion effect: (i) the difference-in-opinion explanation, and (ii) the self-censoring explanation. The first explanation postulates that forecast dispersion is a proxy for different opinions among investors. Short-sale constraints prohibit pessimistic investors from trading, so stock prices reflect only the optimistic views (Miller, 1977). This induces a greater upward bias in the prices of stocks with higher forecast dispersion, which in turn results in lower future returns. The second explanation postulates that the incentive structure of analysts induces them to self-censor unfavorable earnings forecasts to please managers (McNichols and O'Brien, 1997; Scherbina, 2008). DMS (2002) show that when analysts' forecasts are more dispersed, there are more pessimistic forecasts to self-censor. Thus, there is a greater upward bias in the consensus earnings forecast of stocks with higher dispersion in analysts' forecasts. If investors do not take the upward bias into account when making their investment decisions, they tend to overvalue stocks with higher forecast dispersion, which, in turn, leads to lower future returns for these stocks.

The literature thus far has emphasized the difference-in-opinion explanation for two reasons. First, the seminal work of DMS (2002) focuses on this story even though the evidence in their paper also supports the self-censoring explanation. Second, it is difficult to obtain data that contain analysts' incentives, while it is relatively easy to obtain proxies for short-sale constraints. However, the empirical tests of the difference-in-opinion explanation have yielded mixed results. For example, Nagel (2005) uses institutional ownership as a proxy for short-sale constraint. He finds that the dispersion effect is more pronounced in a subsample of stocks with low institutional ownership, supporting the difference-in-opinion story. Boehme et al. (2006) also find that stocks that are subject to high short-sale constraints and high forecast dispersion are more likely to be overvalued. However, Avramov et al. (2009) show that proxies for short-sale costs do not capture the dispersion effect. Scherbina (2008) is one of the few researchers to focus on testing the self-censoring explanation. She estimates the extent of self-censoring based on the proportion of analysts who stop revising their annual earnings forecasts and finds that this measure predicts negative earnings surprises and lower future returns. In an international setting, Hwang and Li (2017) find the dispersion effect to be stronger in countries where the demand for analysts' services is stronger, which they interpret as supporting the self-censoring explanation.

This paper aims to disentangle the difference-in-opinion explanation from the self-censoring explanation using institutional ownership in the U.S. market.[1] The idea is based on two salient features of institutional ownership. First, institutional ownership is commonly used as a proxy for short-sale constraints in the literature (Nagel, 2005; Asquith et al., 2005). Stocks with high institutional ownership are less subject to short-sale constraints, as institutional investors are important suppliers of shares for short selling. Thus, stocks with *higher* institutional ownership will exhibit a *weaker* dispersion effect if the underlying reason for the dispersion effect is difference-in-opinion. Second, institutional ownership is used as a proxy for demand for analysts' services (Frankel et al., 2006), which affects analysts' incentives to self-censor. Like Scherbina (2005), Hwang and Li (2017) model a situation in which analysts receive unfavorable signals about a firm's upcoming earnings, and the incentive structure of analysts induces them either to

[1] Other explanations for the dispersion effect include that of Johnson (2004), who argues that forecast dispersion is a proxy for idiosyncratic parameter risk. Because equity is a call option on firm's assets, in the presence of leverage, expected return decreases with dispersion. Avramov et al. (2009) find that leverage is not relevant for the dispersion effect and argue that the dispersion effect is a manifestation of the negative relationship between default risk and return.

adjust their forecasts upward at a cost of losing reputation, or to issue no forecasts (i.e., self-censor). They show that when analysts face greater demand for their services, they find the reputational cost of adding an optimistic bias to be higher, which makes them more likely to self-censor unfavorable forecasts. As self-censoring induces a greater upward bias to the consensus forecast than adding an optimistic bias does, stocks with greater demand for analysts' services will have a stronger dispersion effect. Since the demand for analysts' services increases with institutional ownership, stocks with *higher* institutional ownership will exhibit a *stronger* dispersion effect if analyst self-censoring explains the dispersion effect.

We start with a general sample of stocks in the Center for Research in Securities Prices database (CRSP) and confirm the findings in Nagel (2005) and Boehme et al. (2006) that the dispersion effect is stronger among stocks with lower institutional ownership in the general sample. These results seem to support the popular difference-in-opinion explanation in the literature, as low institutional ownership is associated with more binding short-sale constraints. Institutional ownership, however, can be endogenous in nature. As institutional investors are generally considered more informed, stocks with bad news and hence low future returns would attract fewer institutional investors and hence have low institutional ownership. This effect would be more significant in stocks with greater information asymmetry or uncertainty. Given that dispersion is a proxy for information asymmetry or uncertainty (Abarbanell, Lanen, and Verrecchia, 1995; Barron et al., 1998), one would expect high dispersion stocks in low institutional ownership quintiles to be dominated by those with bad news and low future returns. As it turns out, this group of stocks is mainly responsible for the dispersion effect among low institutional ownership stocks. Therefore, the results we obtained by comparing dispersion effects among stocks with high and low institutional ownership may be spurious, as they could simply arise from comparing stocks with good and bad news and/or from the information advantage of institutional investors regarding stocks with high information asymmetry, neither of which has anything to do with the two explanations we try to disentangle.

To address this problem, following Boone and White (2015) and Crane, Michenaud, and Weston (2016), we utilize the annual Russell 1000/2000 (a.k.a. Russell 3000) index reconstitution to obtain a sample with exogenous variations in institutional ownership. Stocks in the Russell sample differ in institutional ownership as a result of different index weights. We then compare the dispersion effect of stocks in the bottom of the Russell 1000 index that have low institutional ownership with that of stocks in the top of the Russell 2000 index that have high institutional ownership. The results are the exact opposite of those we found using the general sample. In the portfolio strategy, we find a significant dispersion effect for stocks with higher institutional ownership, but no dispersion effect for stocks with lower institutional ownership. Similarly, in regressions, dispersion negatively predicts returns only when institutional ownership is high. These results suggest that after we address the potential inference problem caused by the endogenous nature of institutional ownership, the dispersion effect is actually stronger for stocks with *higher* institutional ownership. These findings support the analyst self-censoring story over the difference-in-opinion explanation of the dispersion effect.

Since the underlying source of the dispersion effect under the self-censoring explanation is the greater bias in analysts' forecasts associated with high dispersion firms (positive dispersion-bias relationship), our earlier discussions also imply that the positive dispersion-bias relationship will be stronger in stocks with *higher* institutional ownership. Again, the potentially endogenous nature of institutional ownership can bias the test inference. The information advantage of institutional investors makes them less likely to hold stocks with unfavorable prospects; thus stocks with low institutional ownership are more likely to have unfavorable prospects. This – combined with analysts' incentive to self-censor *only* unfavorable forecasts – should lead us to find the dispersion-bias relationship to be stronger among stocks with *low* institutional ownership. This is indeed the case. In the general sample, the spread in forecast bias between high and low dispersion stocks with low institutional ownership is 1.50%, while that for stocks with high institutional ownership is *lower* at 1.05%. This finding indicates a stronger dispersion-bias relationship among stocks with low institutional ownership that might have led us to reject the self-censoring explanation. However, once we avoid the potential endogeneity problem of institutional ownership, we find the opposite. In the Russell sample, the spread in forecast bias between high and low dispersion stocks with low institutional ownership is 0.83%, while that for stocks with high institutional ownership is *higher* at 1.05%. The difference in the spreads in the two samples is statistically significant at the 1% level. In regressions, we also find that while the dispersion-bias relationship is stronger among stocks with *lower* institutional ownership in the general sample, this is the case with *higher* institutional ownership in the Russell sample. These results provide further support to the self-censoring explanation, since a stronger positive dispersion-bias among firms with high institutional ownership in the Russell sample is a prediction unique to the self-censoring explanation; the difference-in-opinion explanation has no prediction on dispersion-bias relationship.

We contribute to three strands of literature. First, we contribute to research on the dispersion effect by showing that using institutional ownership as the proxy for short-sale constraint (e.g., Nagel, 2005; Asquith et al., 2005) can yield misleading results that support the difference-in-opinion hypothesis, because institutional ownership may be endogenous. Using the Russell sample, which is devoid of the endogeneity concern, we find opposite results that support the self-censoring explanation. We are quick to add that our results in no way refute the argument that institutional ownership is a good proxy of short-sale constraint, which in turn prevents the overpricing from being arbitraged away. However, our results do suggest that concern about the possible endogeneity of institutional ownership is warranted, and that the less popular self-censoring story deserves more attention than it has received. This is consistent with the recent international study of Hwang and Li (2017). They conclude that the self-censoring explanation is more plausible because the dispersion effect is stronger in countries with greater demand for analysts' services. Our conclusion is also consistent with the work of Avramov et al. (2009), who find that the dispersion effect is especially strong among stocks with low credit ratings but cannot be explained by short-sale constraints. However, they do not consider the self-censoring incentive of analysts.

Second, we contribute to the literature that uses the Russell index reconstitution as a source of exogenous variation of institutional investors and studies its impacts on firm behaviors. Most of this literature focuses on issues in corporate finance. For example, Boone and White (2015) use it to identify the impact of institutional investors on firm transparency; Appel, Gormley, and Keim (2016) on corporate governance; Chen, Dong and Lin (2016) on CSR activities; Chang, Lin, and Ma (2015) on mergers and acquisitions. Like Chang, Hong, and Liskovich (2014), our study highlights the importance of taking care of the endogenous nature of institutional ownership even in the study of asset pricing. Chang, Hong, and Liskovich (2014) employ the Russell index data to study the impact of stock market indexing on prices. We use it to reexamine a major asset pricing anomaly.

Lastly, we contribute to the literature on analysts' incentives. McNichols and O'Brien (1997) find that analysts are reluctant to issue unfavorable earnings forecasts because of the fear of jeopardizing the investment banking business. O'Brien, McNichols, and Lin (2005) document that investment banking ties reduce the speed with which analysts convey unfavorable news. Ljungqvist et al. (2007) find that analysts' recommendation relative to the consensus is positively associated with investment banking relationships, but institutional investors can moderate the positive effect. Like O'Brien, McNichols, and Lin (2005), we also show that the incentive structure of analysts is significant enough to distort information production in financial markets. However, in contrast to the moderating effect of institutional ownership documented by Ljungqvist et al. (2007), we find that analysts' incentives can be exacerbated by institutional ownership as predicted by Hwan and Li (2017).

2. Data

We obtain analysts' forecast data from the Institutional Brokers Estimate System (I/B/E/S). Dispersion (*DISP*) in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. Analysts' forecasts are adjusted historically for stock splits in the standard issue of I/B/E/S data, which renders these data unsuitable for the analysis of forecast dispersion. Following DMS (2002), we thus use the raw (unadjusted) data reported in the I/B/E/S Summary History file. Forecast bias (*BIAS*) is defined as the difference between analysts' consensus earnings-per-share forecast in the current month and the corresponding actual earnings-per-share announced in the future, scaled by current month stock price.

We obtain quarterly institutional ownership data from Thomson Reuters, which keeps track of the 13-F filings of professional money managers (institutional investors). Institutional investors with investment discretion of $100 million or more are required to file Form 13-F with the SEC within 45 days of the end of each calendar quarter to disclose the number of company shares they hold. These institutional investors include investment advisers, banks, insurance companies, broker-dealers, pension funds, etc. Institutional ownership is calculated as the ratio of the total shares held by institutional investors to total shares outstanding. We take the annual average from quarterly data as the institutional ownership measure we use in this paper. We do not use calendar year; instead, we treat July of year t to June of year t+1 as a whole year.[2]

We obtain monthly stock return data for NYSE, AMEX, and Nasdaq stocks from the Center for Research in Securities Prices (CRSP) database, and we trim 1% of the return on each tail to reduce the impact of data error on our results. Stock-level characteristics are obtained from the CRSP-COMPUSTAT merged database. $LOGMV_{i,t}$ is the natural log of market capitalization of stock *i* in month *t*. Market capitalization is calculated as the last trading day share price of each month times total shares outstanding by that month end. $LOGBM_{i,t}$ is the natural log of the book value of equity to the market value of equity (market capitalization). Book value is calculated as book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock.[3] $MOM_{i,t}$ is the buy-and-hold return for the past six months for stock *i*.

We have two samples in this study. The general sample covers all NYSE, AMEX, and Nasdaq stocks from 1984 to 2006.[4] The general sample is divided into five groups by

[2] The purpose of this is to match with the Russell index reconstitution, which we will discuss in detail in Section 4. Russell reconstitutes its indexes in June of each year.

[3] Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Stockholders' equity is the value reported by COMPUSTAT, if it is available. If not, we measure stockholders' equity as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). Previous fiscal year book value is paired with market capitalization in the current calendar year if the portfolio is formed in or after June; otherwise the book value of the year before the previous fiscal year is used.

[4] This is to ensure that our sample period is the same as in the Russell sample. The Russell sample starts in 1984, and Russell Investment provides us data from 1984 to 2006. The data after 2006 are unsuitable for research

institutional ownership. The second sample consists of 100 stocks in the bottom of the Russell 1000 index and another 100 stocks in the top of the Russell 2000 index each year. We obtain Russell 1000/2000 index constituents and index-weight information from Russell Investment for 1984 to 2006. Stocks in the bottom of the Russell 1000 index have lower institutional ownership than those in the top of the Russell 2000 because index assignment leads to different index weights.

Table 1 lists the summary statistics for main variables in this study for both the general sample and the Russell sample, separated by institutional ownership. In the general sample, the means of dispersion, bias and analyst coverage are much larger when institutional ownership is low. The differences in the mean are statistically significant, which suggests that institutional ownership can be endogenous. After we control for the endogeneity of institutional ownership in the Russell sample, these differences become insignificant. The differences in size and book-to-market are much smaller in the Russell sample than in the general sample, although still statistically significant. This is to be expected, since the Russell index is constructed based on market capitalization.

[Insert Table 1 Here]

3. The Dispersion Effect: The Role of Institutional Investors

3.1 Hypothesis Development

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regarding institutional ownership, since Russell changed its rules regarding index membership after 2006. In order to reduce turnover across indexes, Russell now keeps a past-year Russell 1000 (2000) stock in the new Russell 1000 (2000) index if the market capitalization of the stock drops (increases) to within a small band of the new index cutoff. This practice makes it possible for a bottom-ranking Russell 1000 stock to have a lower market capitalization than a top Russell 2000 firm. In that case, the lower institutional ownership of the bottom Russell 1000 stocks could then be partly a reflection of their lower market capitalization.

Institutional ownership is commonly used as a proxy for short-sale constraint in the literature (Nagel, 2005; Asquith et al., 2005). Stocks with higher institutional ownership are less subject to short-sale constraints as institutional investors are important suppliers of shares to borrow for short selling. Since short-sale constraints are the driving force that explains the dispersion effect in the difference-in-opinion story, one would expect the dispersion effect to be *weaker* among stocks with *higher* institutional ownership.

Institutional ownership can also serve as a proxy for the demand for analysts' services (Frankel et al., 2006). In the model of Hwang and Li (2017), when analysts receive unfavorable signals about a firm's upcoming earnings, the incentive structure of analysts induces them to either adjust their forecasts upward at a cost of losing reputation or choose to issue no forecasts (i.e., self-censor) at another cost that has nothing to do with loss of reputation. As analysts' reputational concerns increase with the demand for their services (Barniv et al. 2005), Hwang and Li (2017) show that analysts whose services are in greater demand find that the cost of reputational loss from adding an optimistic bias is higher, and therefore they choose to self-censor more. They further show that although both self-censoring and adding optimistic bias would induce upward bias that increases with analysts' forecast dispersion (the positive dispersion-bias relationship), the effect coming from the former is stronger. Thus, for stocks with *higher* institutional ownership, there would be a *stronger* positive dispersion-bias relationship and hence a stronger dispersion effect. Note that the difference-in-opinion explanation has no prediction regarding the dispersion-bias relationship. We therefore establish the following two competing hypotheses in which institutional ownership exerts precisely the opposite influence on the dispersion effect.

Hypothesis 1 (Difference-In-Opinion): If the difference-in-opinion explanation drives the dispersion effect, stocks with *high (low)* institutional ownership will exhibit a *weaker (stronger)* dispersion effect, and there is no prediction regarding the dispersion-bias relationship.

Hypothesis 2 (Analyst Self-censoring): If the self-censoring explanation drives the dispersion effect, stocks with *high (low)* institutional ownership will exhibit a *stronger (weaker)* dispersion effect. In addition, there will be a positive dispersion-bias relationship, which is stronger (weaker) among high (low) institutional ownership stocks.

Note that the predictions of Hypothesis 1 and Hypothesis 2 are exact opposites of each other. Thus, these two hypotheses are mutually exclusive: if Hypothesis 1 is supported by the data, Hypothesis 2 would automatically be rejected and vice versa.

3.2 Institutional Ownership and the Dispersion Effect: The General Sample

We first investigate whether and how institutional ownership plays a role in determining the strength of the dispersion effect using the general sample.

3.2.1 Portfolio Strategy

At the end of each month, we sort stocks (with a price of over five dollars) in the general sample into quintiles (D1 to D5) based on that month's analysts' forecast dispersion. D1 contains stocks with the lowest dispersion, while D5 consists of stocks with the highest dispersion. The portfolios are rebalanced each month. At the same time, we sort stocks independently into five quintiles (I1 to I5) each month based on annual average institutional ownership.[5] I1 is the group of stocks with the lowest institutional ownership, and I5 is the group of stocks with the highest

[5] As mentioned in the data section, we treat July of year t to June of year t+1 as a whole year. Thus, for months prior to July of year t, we use average institutional ownership from July of year t-1 to June of year t. We use July of year t to June of year t+1 average institutional ownership for months on or after July of year t.

institutional ownership. We end up with 25 (5X5) portfolios each month. We label our portfolios as I*D*. For example, I1D5 is a portfolio of stocks with the lowest institutional ownership (I1) and the highest dispersion in analysts' forecasts (D5). The dispersion effect of group I* is captured by a hedging portfolio that holds a long position in I*D1 and a short position in I*D5. Monthly portfolio return is calculated as the equal-weighted average of the returns of portfolio stocks.

Before presenting the portfolio results, we first verify that institutional ownership is indeed associated with less binding short-sale constraints. Short-sale constraint is defined as the supply of shares available for shorting times 1000 scaled by the total number of shares outstanding for each stock in each month.[6] The short-sale data are available from June 2002 to December 2013. A higher value means less binding short-sale constraints. For each group formed by institutional ownership (I1 to I5), we calculate the monthly median level of short-sale constraints and report the time-series average of the median. Table 2 reports the results. We see that short-sale constraints are most binding for stocks in I1 and least binding for those in I5. The difference in short-sale constraints is statistically significant at 1% with a t-stat of 4.33. We also present the average of institutional ownership, which is a proxy for the demand of analysts' services. The difference in institutional ownership is large in magnitude and significant between stocks in I1 and I5.

[Insert Table 2 Here]

We next present our 5X5 portfolio strategy results. Table 3 reports the results. In Panel A of the table, we first verify the dispersion effect using all stocks in the general sample. Consistent

[6] We are grateful to Chi-Shen Wei for sharing the data.

with DMS (2002), we find a strong dispersion effect, represented as D1-D5>0. Relative to stocks with low dispersion (D1), high dispersion stocks (D5) earn significantly lower returns whether they are measured as raw returns or as risk-adjusted returns (alpha) from the CAPM, the Fama-French three-factor model (FF3), or the Carhart four-factor model (FF4). Panel D presents the average number of stocks in each portfolio. As Panel B shows, the dispersion effect is much stronger in stocks with low institutional ownership. The hedging portfolio monthly return decreases monotonically from 1.60% for I1 (long in I1D1, short in I1D5) to the insignificant 0.22% for I5 (long in I5D1, short in I5D5) in terms of raw returns. The results are similar after adjustment by factor models including CAPM, FF3, and FF4. These results are consistent with the findings of Nagel (2005) and Boehme et al. (2006).

As stated above, Hypothesis 1 and Hypothesis 2 are mutually exclusive when it comes to the test of dispersion effect; thus, we focus our tests on Hypothesis 1, which predicts that I1D1-I1D5>I5D1-I5D5. To this end, we set up a test with the null H_0: I1D1-I1D5 $\leq$ I5D1-I5D5 and the alternative H_A: I1D1-I1D5>I5D1-I5D5, so that when the null is rejected, we can accept the alternative and conclude that the data support Hypothesis 1 (and reject Hypothesis 2). Note that since the alternative is specified as a strict inequality, this is a one-tailed test (cf. Mann 2010, pp. 387). Test results reported in Panel C reveal that the null is rejected with a p-value of <0.001 for all return measures, indicating that Hypothesis 1 is supported by the data; hence difference-in-opinion is more plausible than self-censoring in explaining the dispersion effect in the general sample. This is consistent with Nagel (2005) and Boehme et al. (2006).

[Insert Table 3 Here]

3.2.2 Regression Approach

In addition to the portfolio approach presented above, we utilize panel regressions to check the impact of dispersion on stock returns when controlling for other stock-level characteristics. The following regression model is performed on stocks in the general sample with the lowest level of institutional ownership (I1) and on stocks with the highest level of institutional ownership (I5).

$$RET_{i,t+1} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}. \quad (1)$$

$RET_{i,t+1}$ is the return of stock i in month $t+1$. $DISP_{i,t}$ is the dispersion in analysts' forecasts at month t. Control variables – including log of market capitalization, log of book-to-market ratio and momentum – are defined in the data section. We include month fixed effects in the model as well. Standard errors are double clustered at the stock and month level.

Panel A of Table 4 reports the regression results separately for subsamples consisting of stocks with low and high institutional ownership and for the combined subsamples.

[Insert Table 4 Here]

The coefficient on *DISP* reported in column 1 is significantly negative. This suggests a significant dispersion effect after we control for the impact of size, book-to-market, and momentum in the sample of stocks with low institutional ownership (low IO). However, the coefficient estimate reported in column 2 is not significantly different from zero, which suggests that there is no significant dispersion effect in the high IO sample. To test if the dispersion effect in the high IO sample is stronger than that in the low IO sample (i.e., to test Hypothesis 1), we pool the two samples and create a dummy *High IO* that equals one for stocks in the high institutional ownership sample. The results are in column 3. Our focus is on γ_1, the coefficient of the interaction term between *DISP* and *High IO*. A positive and significant γ_1 coefficient would indicate that the dispersion effect is stronger in the low IO sample. Note that the null and alternative hypotheses we maintained in Table 3 for Hypothesis 1 are equivalent to the null and alternative hypotheses specified as $H_0: \gamma_1 \leq 0$ and $H_A: \gamma_1 > 0$ of the one-sided test in a regression setting. The test reported in Panel B of Table 4 indicates that the null can be rejected with a p value of <0.001, and we can accept the alternative that the dispersion effect is stronger in the low IO sample, which again supports Hypothesis 1 that difference-in-opinion is the more plausible driver of the dispersion effect.

4. The Dispersion Effect: The Russell Sample

4.1 Bias from Endogenous Institutional Ownership

Institutional ownership is likely endogenous in nature. This is because institutional investors often have an information advantage over ordinary investors, so stocks with low future returns (bad news) would attract fewer institutional investors hence have low institutional ownership. This effect would be more significant in stocks with greater information asymmetry or uncertainty, for which analyst forecast dispersion is a good proxy. Consequently, the endogeneity of institutional ownership and the fact that dispersion is a good proxy for information uncertainty can result in a large return spread between high dispersion stocks in the low institutional ownership quintile and high dispersion stocks in the high institutional ownership quintile. As we noted in an earlier section, this large return spread drives the result that the dispersion effect is stronger in the low institutional ownership quintile than in the high institutional ownership quintile. In other words, any results that we obtain by comparing dispersion effects among stocks with high and low institutional ownership may simply arise from comparing stocks with good and bad news, and/or from institutional investors' information advantage, neither of which has anything to do with the two explanations we are trying to disentangle.

To address this endogeneity in institutional ownership, we make use of the exogenous variation in institutional ownership resulting from the annual Russell 3000 index reconstitution. In what follows, we first introduce the Russell 3000 index and then describe how it generates the exogenous variation in institutional ownership. Finally, we test our hypotheses using the Russell sample.

4.2 Background on the Russell 3000 Index

Russell Investment constitutes the Russell 3000 index comprising the Russell 1000 and 2000 indexes each year starting from 1984. Russell Investment ranks stocks traded in the U.S. by their end-of-May market capitalization in descending order to determine the membership of each index. Stocks ranked between 1 and 1000 are assigned to the Russell 1000 index. Stocks ranked between 1001 and 3000 are assigned to the Russell 2000 index. After determining the membership, Russell Investment calculates the index weight of stocks by their end-of-June float-adjusted market capitalization. We use index-weight ranking in this paper as it is most relevant for institutional ownership.[7] The Russell 1000 and 2000 indexes are value-weighted. Consequently, stocks in the bottom of the Russell 1000 index receive a very low index weight because they are the smallest of the Russell 1000 index stocks. However, stocks ranked below 1000 that are in the top of the Russell 2000 index receive a high index weight because they are the largest of the Russell 2000 stocks. These differences in index weighting for stocks on each

[7] Boone and White (2015) also use index-weight ranking instead of end-of-May market capitalization ranking as index-weight ranking is most relevant for institutional ownership. Additionally, given that we are using 100 stocks around the index threshold, the choice of these two rankings has minimal impact on our results.

side of the 1001st ranking generate exogenous variation in institutional ownership, either by passive institutional investors who directly track the index, or by active institutional investors whose performances are benchmarked against these indexes. Figure 1 plots average institutional ownership (the ratio of shares held by professional money managers to total shares outstanding) for stocks around the threshold ranking (1001st) that determines the index membership. The horizontal axis is the difference between the ranking of a stock and 1001. Stocks to the left (negative distance) are those in the bottom of the Russell 1000 index, while stocks to the right (non-negative distance) are those in the top of the Russell 2000 index. On each side, we group stocks into 20 non-overlapping bins (bin width is 10 distance units). The dots represent the average of institutional ownership of stocks within each bin, and the curve is a third-order polynomial fit of the dots on each side. Figure 1 shows a clear discontinuity in institutional ownership, which is substantially lower for stocks in [-100, 0), i.e., the smallest 100 stocks in the Russell 1000 index. We therefore use 100 stocks around each side of the threshold. We obtain index membership data from Russell Investment from 1984 to 2006. After 2006, Russell Investment changed its method of determining membership, rendering the data unsuitable for research purposes. In order to reduce turnover across indexes, Russell now keeps a past year Russell 1000 (2000) stock in the new Russell 1000 (2000) index if the market capitalization of the stock drops (increases) to within a small band of the new index cutoff. This practice makes it possible for a bottom-ranking Russell 1000 stock to have a lower market capitalization than a top-ranking Russell 2000 firm. In that case, the lower institutional ownership of the bottom Russell 1000 stocks could then be partly a reflection of their lower market capitalization.

[Insert Figure 1 Here]

Instead of using the general sample, we focus on the 100 stocks at the bottom of the Russell 1000 index and the 100 stocks at the top of the Russell 2000 index. Stocks that are further away from the 1001^{st} threshold ranking may be substantially different from those around the 1001^{st} threshold ranking in unobservable characteristics that may confound our identification strategy. The choice of 100 as the bandwidth is a compromise between sample size and difference in characteristics between the two groups of stocks on each side. Note that in Panel B of Table 1, the characteristics of the bottom 100 Russell 1000 stocks and those of the top 100 Russell 2000 stocks are very much alike. Comparing the magnitude of the dispersion effect on each side of the threshold gauges the impact of institutional ownership on the dispersion effect. The impact is plausibly causal as the differences in institutional ownership are induced by different index weights.

4.2 Portfolio Strategy

We perform the same portfolio analysis for the Russell sample that we performed for the general sample. At the end of each month after reconstitution in year t (July of year t to June of year t+1)[8], we sort stocks (with a price of over five dollars) into five quintiles (D1 to D5) based on analysts' forecast dispersion, irrespective of their index assignment. D1 contains stocks with the lowest dispersion, while D5 consists of stocks with the highest dispersion. Instead of sorting independently on institutional ownership as in the general sample, we rely on index membership to identify low and high institutional ownership stocks in the Russell sample. We label the stocks in the bottom of the Russell 1000 index R1. These are the stocks with low institutional

[8] This matches the strategy we used in the general sample. Assigning a stock to the bottom of the Russell 1000 index means that it will have low institutional ownership from July of year t to June of year t+1. In the general sample, we calculate annual average institutional ownership using quarterly 13-F data that fall into July of year t to June of year t+1. In other words, annual institutional ownership is the average of institutional ownership calculated from data in four quarterly 13-F filings (September and December of year t, and March and June of year t+1).

ownership. We label the stocks in the top of the Russell 2000 index R2. These are the stocks with high institutional ownership. We end up with 10 (2X5) portfolios each month. The portfolios are rebalanced each month.

Before presenting our results, we again verify that institutional ownership is indeed associated with less binding short-sale constraints in this Russell sample. We again measure short-sale constraint as the supply of shares available for shorting times 1000 scaled by total number of shares outstanding for each stock in each month. For each group (R1 and R2), we calculate the monthly median level of short-sale constraints and take the time-series average of the median. Table 5 reports the results. We see that short-sale constraint is more binding for stocks in R1 than for those in R2. The difference in short-sale constraint is statistically significant at 5% with a t-stat of 2.38. Institutional ownership is also statistically higher for stocks in the top of the Russell 2000 index (R2).

[Insert Table 5 Here]

We next present our 2X5 portfolio strategy results. Panel A of Table 6 reveals an insignificant dispersion effect among the low institutional ownership portfolio R1, but a strong and significant dispersion effect in the high institutional ownership portfolio R2 irrespective of the return measures. For example, the FF4 alpha of high dispersion firms (D5) is lower than that of low dispersion firms (D1) by 0.76% per month in R2. These results are remarkable as they are completely opposite to what we found in Table 3 with the general sample, even though short-sale constraint is more binding for stocks in R1 than for those in R2.

[Insert Table 6 Here]

Next, we are interested in finding out if – after we address the endogeneity issue via the Russell sample – self-censoring becomes a more plausible explanation for the dispersion effect than difference-in-opinion (i.e., if Hypothesis 2 is supported by the data instead). To this end, we set up a test in which the prediction of Hypothesis 2 is the alternative H_A: R1D1-R1D5 $>$ R2D1-R2D5, and H_0: R2D1-R2D5 $\leq$ R1D1-R1D5 is the null. Again, because the alternative is specified as a strict inequality, this would be a right-tailed test. Panel B of Table 6 shows that although the test is handicapped by the relatively low power resulting from the small number of stocks in each dispersion quintile (as reported in Panel C of Table 6), the null can be rejected at the 10% level based on raw returns. The results are similar if we risk-adjust the return by CAPM, the FF3 model, or the FF4 model, although for FF3, the p-value is 0.11. The rejection of the null constitutes support for Hypothesis 2 and hence the rejection of Hypothesis 1. This suggests that the oft-neglected analyst self-censoring story, as opposed to the difference-in-opinion story, is the more plausible explanation of the dispersion effect in a sample that is largely free from the bias caused by the endogeneity of institutional ownership.

4.3 Regression Approach

We repeat the regression tests on the Russell sample in Table 4. Stocks with low institutional ownership (R1) are those in the bottom of the Russell 1000 index, and stocks with high institutional ownership (R2) are those on the top of the Russell 2000 index. The results are reported in Panel A of Table 7.

[Insert Table 7 Here]

In column (1), the coefficient estimate on *DISP* is not statistically significant, suggesting that there is no dispersion effect in R1. In contrast, the negative and significant coefficient on *DISP* in column (2) suggests a significant dispersion effect in stocks with higher institutional ownership in R2. In column (3), the negative coefficient on the interaction term between *DISP* and *High IO* from the combined sample also suggests a stronger dispersion effect among stocks with higher institutional ownership, consistent with Table 6. As a formal test, we test the null $H_0 \ \gamma_1 \geq 0$ against the prediction of Hypothesis 2 (i.e., $H_A: \gamma_1 < 0$). The test results in Panel B reveal that in the Russell sample we reject the null and accept the alternative (Hypothesis 2) at the 5% significance level. This is consistent with the earlier finding from the portfolio tests reported in Table 6.

Overall, our results in this section indicate that both portfolio tests and regression tests reject difference-in-opinion in favor of self-censoring as a more plausible explanation of the dispersion effect in a sample that is not contaminated by the endogeneity of institutional ownership. The fact that we draw a completely opposite conclusion in such a sample suggests that we are justified in our concern about the endogeneity of institutional ownership and the bias it causes in the general sample.

5. The Dispersion-Bias Relationship

So far, we have found the dispersion effect to be stronger for stocks with high institutional ownership in a sample where the variation of institutional ownership is exogenously induced, which is consistent with the view that self-censoring is a more plausible story than difference-in-opinion as an explanation of the dispersion effect. For further validation, we subject the self-censoring story to an additional test on the dispersion-bias relationship. As stated in Hypothesis (2), self-censoring implies a positive dispersion-bias relationship that is stronger among stocks with higher institutional ownership.

We start by calculating the bias for each of the 2X5 portfolios formed with the Russell sample. Forecast bias (*BIAS*) is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by the current price of the stock. For each portfolio, we first calculate the monthly median of *BIAS* and then take the time-series average of the median. The results are reported in Panel A of Table 8.

[Insert Table 8 Here]

As the self-censoring story predicts, there is a positive dispersion-bias relationship in both the low and high institutional ownership subsamples. For the subsample of stocks with high institutional ownership (R2), the bias in analysts' forecasts increases monotonically from 0.06% for the low dispersion portfolio (R2D1) to 1.11% in the high dispersion portfolio (R2D5). The spread in bias is 1.05%. For the subsample with low institutional ownership (R1), the bias in analysts' forecasts also increases monotonically from 0.11% for the low dispersion portfolio (R1D1) to 0.94% in the high dispersion portfolio (R1D5). The spread in bias is 0.83%, lower than that of the high institutional ownership stocks. The difference in the spread (DID) is 0.22%, which is statistically different from zero with a p-value of 0.009.[9] This substantiates the stronger positive dispersion-bias relationship in the high institutional ownership stocks predicted by the analyst self-censoring explanation.

In the general sample, institutional investors have an information advantage and thus are less likely to hold stocks with bad news. This, combined with analysts' incentive to self-censor only

[9] We report the two-sided t test here since, unlike the alternatives in the earlier tests, the alternative test here is about an equality (that spread in *BIAS* in I1 and I2 subsamples are not equal) as opposed to a directional inequality. This is because in previous tests, H1 and H2 are tested as mutually exclusive hypotheses, but only H2 is tested here because H1 has no prediction about the dispersion-bias relationship.

unfavorable forecasts, makes self-censoring more likely among low institutional ownership stocks with high dispersion. In other words, unlike in the Russell sample, in the general sample, the endogenous nature of institutional ownership should manifest itself in a stronger dispersion-bias relationship among stocks with lower institutional ownership. This is indeed what we find. Panel B reports *BIAS* for each of the 5X5 general sample portfolios we constructed in Table 3, calculated in the same way as the Russell portfolios. As in the Russell sample, we also observe a positive dispersion-bias relationship for stocks in each institutional ownership quintile. However, in contrast to the result for the Russell sample, we find that the spread in *BIAS* is larger in stocks with lower institutional ownership. The spread in *BIAS* decreases monotonically from 1.50% in the lowest institutional ownership quintile (I1) to 1.05% in the highest institutional ownership quintile (I5). And the difference in the spreads (-0.45%) is significantly different from zero, contrary to the prediction of the self-censoring story. These results demonstrate that the endogeneity of institutional ownership can bias the inferences from tests of the dispersion-bias relationship just as it does for the tests of the dispersion effect. It is worth pointing out that this bias is premised on analysts' self-censoring. Thus, the significance of the bias in the general sample can be viewed as additional supporting evidence for the self-censoring explanation, over and above the evidence obtained from the Russell sample discussed earlier.

We next turn to regression analysis. We use the following panel regression to test the dispersion-bias relationship:

$$BIAS_{i,t} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}. \quad (2)$$

$BIAS_{i,t}$ is the is the bias in the consensus forecast for stock *i* in month *t*. $DISP_{i,t}$ is the dispersion in analysts' forecasts at month *t*. Control variables – including log of market capitalization, log of book-to-market ratio and momentum – are defined in the data section. We include month fixed effects in the model as well. Standard errors are double clustered at both the stock and month level.

Table 9 reports the regression results. In both subsamples of stocks with low and high institutional ownership, we obtain a positive relationship between *DISP* and *BIAS*. In the Russell sample (Panel A), the magnitude of the coefficient on *DISP* is larger in the subsample with high institutional ownership (0.013 vs. 0.003). To test whether the coefficient on *DISP* for the subsample with higher institutional ownership is indeed higher than that for the subsample with lower institutional ownership, we pool the two subsamples and use a dummy variable, *High_IO*, to indicate membership in the subsample with high institutional ownership in column (3). The coefficient on the interaction term *DISP*High IO* is positive and significant, indicating that the dispersion-bias relationship is significantly stronger in the Russell sample among stocks with higher institutional ownership, consistent with earlier results obtained from the portfolio analysis in Table 8.

For the general sample (Panel B), we again observe precisely the opposite results: the predictive power of *DISP* is stronger in the sample of stocks with *low* institutional ownership. The difference is significant, as in the pooled sample (column (3)), the coefficient on the interaction term is negative and statistically significant. This is also consistent with the results from the portfolio analysis in Table 8.

[Insert Table 9 Here]

To sum up, we find that a positive dispersion-bias relationship is present in both the general sample and the Russell sample. By itself, this result supports the self-censoring explanation over the difference-in-opinion explanation, as the latter is silent on the direction of the relationship. Furthermore, we find a stronger (more positive) dispersion-bias relationship among stocks with high institutional ownership in the Russell sample and the exact opposite in the general sample. These results are consistent with both the self-censoring hypothesis and the existence of a significant endogeneity bias of institutional ownership in the general sample. These results are also parallel to what we find with the dispersion effect (the negative dispersion-return relationship). Both sets of results demonstrate the importance of controlling for the endogeneity of institutional ownership in the investigation of the dispersion effect, and they suggest that self-censoring is the more plausible explanation for the dispersion effect, at least in a sample in which the endogeneity of institutional ownership is not a concern.

6. Conclusion

This paper attempts to disentangle two plausible explanations of the dispersion effect (analyst self-censoring vs. difference-in-opinion) by constructing two mutually exclusive hypotheses regarding the effect of institutional ownership on the strength of the dispersion effect. The difference-in-opinion explanation predicts a stronger dispersion effect among stocks with lower institutional ownership. The self-censoring explanation predicts the exact opposite. Although our initial results confirm the findings in the literature that the dispersion effect is stronger among stocks with lower institutional ownership and seem to support the difference-in-opinion explanation, we raise the concern that this conclusion can be tainted by the possible endogeneity of institutional ownership. Using a sample from Russell index reconstitution, in which the variation of institutional ownership is exogenously induced, we find the opposite results. We find parallel results when we focus on the relationship between dispersion and bias. These findings suggest that the self-censoring story may be more plausible than the popular difference-in-opinion story as an explanation of the dispersion effect, and it deserves more attention in the literature.

Our paper highlights the importance of controlling for the endogeneity of institutional ownership when institutional ownership is part of the hypothesis for the explanation of characteristics-sorted return effects, if the characteristics also proxy for the degree of the institutional investors' information advantage.

References

Abarbanell, Jeffery S., William N. Lanen, and Robert E. Verrecchia, 1995, Analysts' forecasts as proxies for investor beliefs in empirical research, *Journal of Accounting and Economics* 20, 31-60.

Appel, Ian, Todd A. Gormley, and Donald B. Keim, 2016, Passive investors, not passive owners, *Journal of Financial Economics* 121(1), 111-141.

Asquith, Paul, Parag A. Pathak, and Jay R. Ritter, 2005, Short interest, institutional ownership, and stock returns, *Journal of Financial Economics* 78, 243-276.

Avramov, Doron, Tarun Chordia, Gergana Jostova, and Alexander Philipov, 2009, Dispersion in analysts' earnings forecasts and credit rating, *Journal of Financial Economics* 91, 83-101.

Barniv Ran, Mark J. Myring, and Wayne B. Thomas, 2005, The association between the legal and financial reporting environments and forecast performance of individual analysts, *Contemporary Accounting Research* 22, 727-758.

Barron, Orie E., Oliver Kim, Steve C. Lim, and Douglas E. Stevens, 1998, Using analysts' forecasts to measure properties of analysts' information environment, *Accounting Review* 421-433.

Boehme, Rodney D., Bartley R. Danielsen, and Sorin M. Sorescu, 2006, Short-sale constraints, differences of opinion, and overvaluation, *Journal of Financial and Quantitative Analysis* 41, 455-487.

Boone, Audra L., and Joshua T. White, 2015, The effect of institutional ownership on firm transparency and information production, *Journal of Financial Economics* 117, 508-533.

Carhart, Mark M., 1997, On persistence in mutual fund performance, *The Journal of Finance* 52, 57-82.

Chang, Eric C., Tse-Chun Lin, and Xiaorong Ma, 2015, Does short-selling threat discipline managers in mergers and acquisitions decisions?, working paper.

Chang, Yen-Cheng, Harrison Hong, and Inessa Liskovich, 2014, Regression discontinuity and the price effects of stock market indexing, *Review of Financial Studies* 28(1), 212-246.

Chen, Tao, Hui Dong, and Chen Lin, 2016, Institutional shareholders and corporate social responsibility: Evidence from two quasi-natural experiments, working paper.

Crane, Alan D., Sébastien Michenaud, and James P. Weston, 2016, The effect of institutional ownership on payout policy: Evidence from index thresholds, *Review of Financial Studies* 29(6), 1377-1408.

Diether, Karl B., Christopher J. Malloy, and Anna Scherbina, 2002, Differences of opinion and the cross section of stock returns, *Journal of Finance* 57, 2113-2141.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

Frankel, R., S. P. Kothari, and J. Weber, 2006, Determinants of the informativeness of analyst research, *Journal of Accounting and Economics* 41, 29-54.

Hwang, Chuan-Yang, and Yuan Li, 2017, Analysts' reputation concerns, self-censoring and the international dispersion effect, *Management Science*, Forthcoming.

Johnson, Timothy C., 2004, Forecast dispersion and the cross section of expected returns, *Journal of Finance* 59, 1957-1978.

Ljungqvist, Alexander, Felicia Marston, Laura T. Starks, Kelsey D. Wei, and Hong Yan, 2007, Conflicts of interest in sell-side research and the moderating role of institutional investors, *Journal of Financial Economics* 85, 420-456.

O'Brien, Patricia C., Maureen F. McNichols, and Hsiou-wei Lin, 2005, Analyst impartiality and investment banking relationships, *Journal of Accounting Research* 43, 623-650.

Mann, Prem S., 2010, *Introductory Statistics*, 7th Edition, Wiley.

McNichols, Maureen F., and Patricia C. O'Brien, 1997, Self-selection and analyst coverage, *Journal of Accounting Research* 35, 167-199.

Miller, Edward M., 1977, Risk, uncertainty, and divergence of opinion, *Journal of Finance* 32, 1151-1168.

Nagel, Stefan, 2005, Short sales, institutional investors and the cross-section of stock returns, *Journal of Financial Economics* 78, 277-309.

Scherbina, Anna, 2005, Analyst disagreement, forecast bias and stock returns, Working paper, University of California, Davis.

Scherbina, Anna, 2008, Suppressed negative information and future underperformance, *Review of Finance* 12, 533-565.

Figure 1 **Average Institutional Ownership around the Russell 1000/2000 Index Threshold**

This figure displays the average institutional ownership of stocks around the Russell 1000/2000 index threshold in the sample period. The vertical axis is the total institutional ownership. The horizontal axis is the distance from the threshold (1001st ranking) market capitalization ranking that separates the Russell 1000 index from the Russell 2000 index. Stocks with positive distance are in the Russell 2000 index, while stocks with negative distance are in the Russell 1000 index. The sample spans from 1984 to 2006. Russell index data are obtained from Russell Investment. For each stock each year, total institutional ownership is calculated as the ratio of total shares held by institutional money managers to total shares outstanding. The information regarding shares held by institutional money managers is obtained from quarterly 13-F filings data from Thompson Reuters (from September year t to June year t+1 for the Russell index in year t). Stocks are divided into 20 non-overlapping bins on each side of the threshold. The dots in the figure represent the average institutional ownership of stocks within each bin. The curves represent a third-order polynomial fit of the dots.

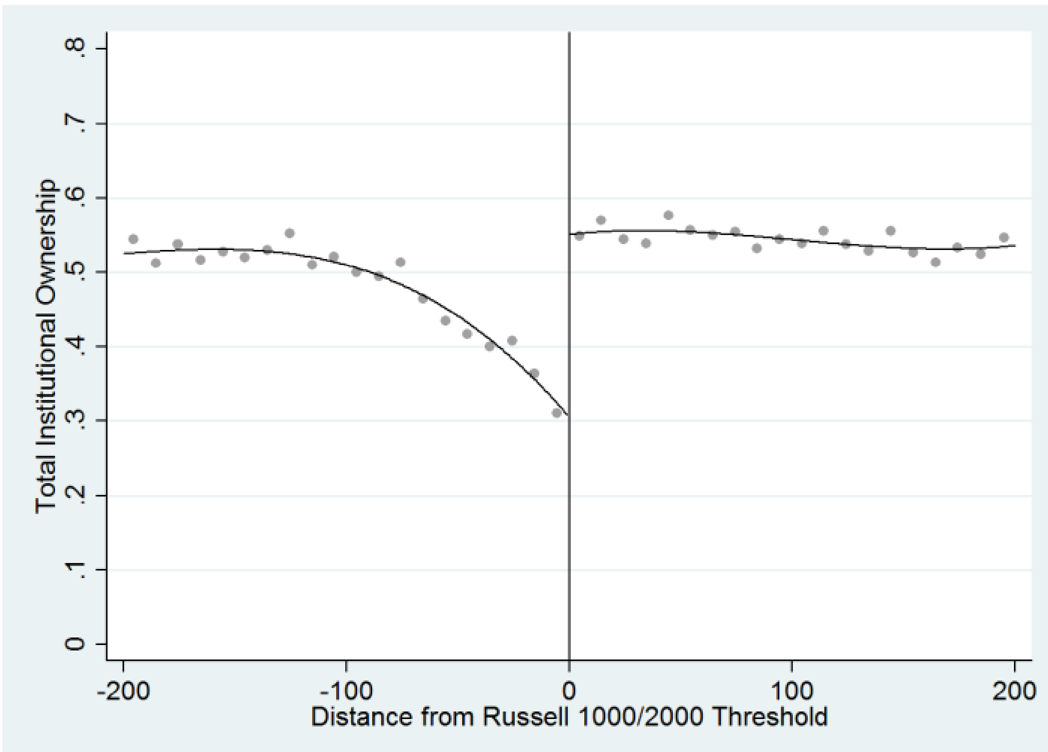

Table 1 **Summary Statistics**

This table presents summary statistics for the main variables used in this study. The general sample covers all NYSE, AMEX, and Nasdaq stocks from 1984 to 2006. The general sample is divided into five groups by institutional ownership. For each stock, institutional ownership is calculated by dividing total shares held by institutional money managers who file 13-F filings to total shares outstanding. We take the average of data from four quarterly 13-F filings (September, December, March and June) as the measure of institutional ownership. One year is from September to June of the next year because the Russell index is reconstituted in June. We report the summary statistics for the groups with the lowest and highest institutional ownership (*IO*) in Panel A. The second sample, the Russell sample, consists of 100 stocks in the bottom of the Russell 1000 index and another 100 stocks in the top of the Russell 2000 index each year from 1984 to 2006. We report summary statistics for the Russell sample in Panel B. Dispersion (*DISP*) in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. Forecast bias (*BIAS*) is defined as the analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by the current price of the stock. *COVERAGE* is the log of the number of analysts who have issued fiscal year one earnings forecasts for the stock in each month plus one. *LOGMV* is the natural log of market capitalization. Market capitalization is calculated as the product of share prices and total shares outstanding. *LOGBM* is the natural log of the book value of equity to the market value of equity (market capitalization). Book value is calculated as book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Stockholders' equity is the value reported by COMPUSTAT, if it is available. If not, we measure stockholders' equity as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). Fiscal year t-1 book value is paired with market capitalization in the current calendar year t if the portfolio is formed on or after June; otherwise we use the book value of fiscal year t-2. *IO* is the percentage of institutional ownership. *DIFF(MEAN)* is the difference in the mean in characteristics between the two groups of stocks. t-statistics are reported. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

Panel A General Sample

Lowest IO (I1)				**Highest IO (I5)**					
	N	*MEAN*	*STD*		*N*	*MEAN*	*STD*	*DIFF (MEAN)*	*t-stat*
DISP	109636	0.19	0.96	DISP	129730	0.13	1.03	0.06***	14.27
BIAS	103050	0.02	0.09	BIAS	126968	0.01	0.05	0.01***	26.46
COVERAGE	109636	1.57	0.50	COVERAGE	129370	2.40	0.60	-0.83***	-365.45
LOGMV	109636	12.21	1.36	LOGMV	129730	13.84	1.26	-1.63***	-305.52
LOGBM	109636	-7.73	0.85	LOGBM	129730	-7.85	0.89	0.12***	33.30
IO	109636	0.18	0.10	LOGBM	129730	0.77	0.15	-0.59***	-1110.27

Panel B Russell Sample

Low IO (R1)				High IO (R2)					
	N	*MEAN*	*STD*		*N*	*MEAN*	*STD*	*DIFF (MEAN)*	*t-stat*
DISP	17764	0.16	1.11	DISP	20115	0.15	0.83	0.01	1.61
BIAS	17189	0.01	0.13	BIAS	19447	0.01	0.09	0.00	-0.87
COVERAGE	17764	2.15	0.48	COVERAGE	20115	2.14	0.46	0.01	-1.40
LOGMV	17764	13.63	0.90	LOGMV	20115	13.41	0.81	0.22***	24.21
LOGBM	17764	-7.77	0.95	LOGBM	20115	-7.85	0.94	0.08***	8.12
IO	17757	0.45	0.26	IO	20104	0.57	0.26	-0.12***	-43.86

Table 2 **Institutional Ownership and Short-Sale Constraint: The General Sample**

This table presents short-sale constraint and institutional ownership across institutional ownership groups for the general sample. At the end of each month, we divide all stocks in the general sample into five portfolios based on institutional ownership. For each stock, we calculate institutional ownership by dividing total shares held by institutional money managers who file 13-F filings to total shares outstanding. We take the average of data from four quarterly 13-F filings (September, December, March and June) as the measure of institutional ownership. One year is from September to June of the next year because the Russell index is reconstituted in June. I1 (I5) includes stocks with the lowest (highest) institutional ownership. Monthly short-sale constraint is defined as the supply of shares available for short sale times 1000 scaled by total number of shares outstanding for each stock in each month. A higher value means less binding short-sale constraints. For each group, we first calculate the monthly median of short-sale constraint and institutional ownership and then calculate the time-series average of the median. The difference (*DIFF*) is the difference in value between group I1 and group I5, and the associated t-stat is given. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

	Lowest IO				Highest IO	
	I1	**I2**	**I3**	**I4**	**I5**	**DIFF**
Short-Sale Constraint (‰)	31.26	62.53	77.47	89.01	104.49	73.23***
t-stat						4.33
Institutional Ownership (%)	18.23	34.93	45.21	60.61	74.67	56.44***
t-stat						63.34

Table 3 **Institutional Ownership and the Dispersion Effect: The General Sample**

Panel A of this table presents the dispersion effect for all stocks in the general sample. Panel B of this table presents the dispersion effect across institutional ownership groups for the general sample. Panel C presents the tailed test of *whether the difference-in-opinion explanation is more plausible than the self-censoring explanation*. Panel D reports the average number of stocks in each portfolio across the sample period. At the end of each month, we first divide all stocks in the general sample into five groups based on dispersion in analysts' earnings forecasts. Dispersion in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. D1 (D5) includes stocks with the lowest (highest) dispersion. We then independently form five groups of stocks based on institutional ownership. For each stock, institutional ownership is calculated by dividing total shares held by institutional money managers who file 13-F filings to total shares outstanding. We take the average of data from four quarterly 13-F filings (September, December, March and June) as the measure of institutional ownership. One year is from September to June of the next year because the Russell index is reconstituted in June. I1 (I5) includes stocks with the lowest (highest) institutional ownership. We end up with 25 (5X5) portfolios. IaDb represents a stock selected from groups Ia and Db. After being assigned to portfolios, stocks are held for one month. D1-D5 is the return of the hedge portfolio that holds a long position in stocks of D1 and a short position in stocks of D5. The monthly return (in percentage) of each portfolio is the equal-weighted average of the returns of all the stocks in the portfolio. We report returns in bold, including raw monthly returns (RAW), the CAPM alpha, alpha from the Fama-French three-factor model (FF3), and alpha from the Fama-French three-factor model augmented by the Carhart momentum factor (FF4). Newy-West t-statistics are reported. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

Panel A. Dispersion Effect

All Stocks	*Dispersion*					
	D1	**D2**	**D3**	**D4**	**D5**	**D1-D5**
RAW	**1.38**	**1.29**	**1.14**	**0.94**	**0.44**	**0.95*****
t-stat	6.32	5.93	5.11	3.76	1.52	4.51
CAPM	**0.99**	**0.89**	**0.73**	**0.53**	**0.02**	**0.97*****
t-stat	4.26	3.88	3.19	2.08	0.06	4.59
FF3	**0.96**	**0.86**	**0.71**	**0.49**	**-0.01**	**0.98*****
t-stat	4.18	3.72	3.06	1.90	-0.05	4.60
FF4	**1.04**	**0.92**	**0.78**	**0.54**	**0.03**	**1.01*****
t-stat	4.19	3.75	3.14	1.91	0.08	4.31

Panel B. Institutional Ownership and the Dispersion Effect

Raw Return	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
I1	**1.07**	**0.92**	**0.65**	**0.14**	**-0.53**	**1.60*****
t-stat	4.20	3.54	2.33	0.47	-1.58	5.55
I2	**1.26**	**1.17**	**0.85**	**0.76**	**0.13**	**1.13*****
t-stat	5.35	5.14	3.46	2.90	0.38	4.44
I3	**1.39**	**1.27**	**1.15**	**1.03**	**0.67**	**0.72*****
t-stat	5.65	5.25	5.06	4.03	2.13	3.54
I4	**1.47**	**1.36**	**1.42**	**1.32**	**1.07**	**0.40***
t-stat	6.54	6.41	6.37	5.21	4.15	1.92
I5	**1.69**	**1.60**	**1.55**	**1.53**	**1.46**	**0.22**
t-stat	8.10	7.28	6.85	6.23	5.13	1.04

CAPM	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
I1	**0.66**	**0.49**	**0.22**	**-0.30**	**-0.96**	**1.62*****
t-stat	2.48	1.80	0.78	-1.01	-2.76	5.53
I2	**0.86**	**0.76**	**0.43**	**0.34**	**-0.30**	**1.16*****
t-stat	3.52	3.21	1.75	1.28	-0.90	4.48
I3	**0.99**	**0.87**	**0.74**	**0.61**	**0.26**	**0.73*****
t-stat	3.83	3.49	3.12	2.38	0.84	3.66
I4	**1.08**	**0.99**	**1.01**	**0.93**	**0.65**	**0.42****
t-stat	4.60	4.37	4.40	3.64	2.47	2.00
I5	**1.31**	**1.21**	**1.16**	**1.12**	**1.07**	**0.24**
t-stat	5.85	5.17	5.02	4.51	3.82	1.13

FF3	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
I1	**0.61**	**0.45**	**0.19**	**-0.37**	**-0.98**	**1.59*****
t-stat	2.33	1.63	0.66	-1.26	-2.89	5.61
I2	**0.82**	**0.74**	**0.40**	**0.31**	**-0.34**	**1.16*****
t-stat	3.41	3.10	1.65	1.13	-1.04	4.67
I3	**0.97**	**0.82**	**0.71**	**0.57**	**0.24**	**0.74*****
t-stat	3.75	3.30	2.92	2.19	0.72	3.53
I4	**1.07**	**0.95**	**1.00**	**0.91**	**0.62**	**0.44****
t-stat	4.53	4.17	4.29	3.43	2.25	2.08
I5	**1.29**	**1.21**	**1.15**	**1.12**	**1.02**	**0.28**
t-stat	5.83	4.98	4.88	4.13	3.40	1.17

FF4	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
I1	**0.66**	**0.46**	**0.24**	**-0.35**	**-0.90**	**1.56*****
t-stat	2.41	1.57	0.81	-1.08	-2.42	5.18
I2	**0.86**	**0.78**	**0.45**	**0.35**	**-0.31**	**1.17*****
t-stat	3.33	3.09	1.79	1.16	-0.85	4.33
I3	**1.06**	**0.89**	**0.78**	**0.60**	**0.25**	**0.81*****
t-stat	3.77	3.41	3.04	2.17	0.69	3.43
I4	**1.16**	**1.03**	**1.07**	**0.98**	**0.66**	**0.51****
t-stat	4.59	4.25	4.39	3.48	2.38	2.33
I5	**1.39**	**1.30**	**1.22**	**1.17**	**1.03**	**0.37**
t-stat	5.81	5.08	4.92	4.20	3.49	1.55

Panel C. Test for Hypothesis 1 (difference-in-opinion)

H_0 **: (**I1D1-I1D5 ≤ I5D1-I5D5**)**
H_A **: Hypothesis 1 (**I1D1-I1D5> I5D1-I5D5**)**

	RAW	**CAPM**	**FF3**	**FF4**
(I1D1-I1D5)-(I5D1-I5D5)	**1.38**	**1.39**	**1.32**	**1.20**
p-value	0.00	0.00	0.00	0.00

Panel D. Average Number of Stocks in Each Portfolio

Observations	*Dispersion*				
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**
I1	100	83	89	100	121
I2	95	96	97	98	107
I3	94	99	99	100	101
I4	101	103	102	101	87
I5	104	112	106	94	76

Table 4 **Institutional Ownership and the Dispersion Effect: The General Sample**

Panel A of this table presents the regression results from the following model:

$$RET_{i,t+1} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$$

$$RET_{i,t+1} = \beta_0 + \gamma_1 DISP_{i,t} * High\_IO_{i,t} + \gamma_2 DISP_{i,t} + \gamma_3 High\_IO_{i,t} + \gamma_4 LOGMV_{i,t} + \gamma_5 LOGBM_{i,t} + \gamma_6 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$$

for the general sample. The dependent variable *RET* is monthly stock return. *DISP*, *LOGMV*, *LOGBM*, and *MOM* are dispersion, log of market capitalization, log of book-to-market ratio, and momentum, as defined in Table 1. We run the regression separately for stocks with the lowest institutional ownership (I1) and for stocks with the highest institutional ownership (I5). To test the difference of the coefficients of *DISP* across the two samples, we run a pooled regression with High IO as a dummy for the group of stocks with high IO in Column (3). We include month fixed effects in each regression. Standard errors are clustered at both the month and stock level. t-stats are in parentheses. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively. Panel B reports the right-tailed test for $\gamma_1 > 0$ implied by the difference-in-opinion hypothesis. Panel B reports the one-sided t-test for the coefficient on *DISP*High IO* with self-censoring as the null hypothesis.

Panel A. Panel Regression Results

	Full Sample		
	(1)	(2)	(3)
	Low IO	High IO	Combined
DISP	**-0.193*** **	**-0.022**	**-0.197*** **
	(-3.70)	**(-0.65)**	**(-3.75)**
DISP*High IO			**0.163*** **
			(2.74)
High IO			1.210***
			(8.07)
LOGBM	0.710***	-0.025	0.315***
	(5.97)	(-0.22)	(3.02)
LOGMV	0.033	-0.147**	-0.038
	(0.64)	(-2.54)	(-0.80)
MOM	0.562**	0.069	0.381
	(2.04)	(0.16)	(1.16)
Intercept	15.315***	15.312***	14.248***
	(16.63)	(18.23)	(18.69)
Time Fixed Effects	Yes	Yes	Yes
Adjusted R2	0.124	0.193	0.151
Observations	109,636	129,730	239,366

Panel B. Test for Hypothesis 1 (difference-in-opinion)

H_0 **:** $(\gamma_1 \leq 0)$

H_A **: Hypothesis 1 (**$\gamma_1 > 0$**)**

Coefficient on DISP*High IO (γ_1**)**	**0.163**
p-value	0.00

Table 5 **Institutional Ownership and Short-Sale Constraint: The Russell Sample**

This table presents short-sale constraint and institutional ownership across institutional ownership groups for the Russell sample. Stocks in the bottom of the Russell 1000 are labeled group R1 and have low institutional ownership. Stocks in the top of the Russell 2000 index are labeled group R2 and have high institutional ownership. For each stock, institutional ownership is calculated by dividing total shares held by institutional money managers who file 13-F filings to total shares outstanding. We take the average of data from four quarterly 13-F filings (September, December, March and June) as the measure of institutional ownership. One year is from September to June of the next year because the Russell index is reconstituted in June. Monthly short-sale constraint is defined as the supply of shares available for short sale times 1000 scaled by total number of shares outstanding for each stock in each month. A higher value means less binding short-sale constraints. For each group, we first calculate the monthly median of short-sale constraint and institutional ownership and then calculate the time-series average of the median. The difference (*DIFF*) is the difference in value between group R1 and group R2, and the associated t-stat is given. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

	Low IO	High IO	
	R1	**R2**	**DIFF**
Short-Sale Constraint (‰)	56.07	98.58	42.51**
t-stat			2.38
Institutional Ownership (%)	44.05	59.54	15.49***
t-stat			11.41

Table 6 **Institutional Ownership and the Dispersion Effect: The Russell Sample**

Panel A of this table presents the dispersion effect across institutional ownership groups for the Russell sample. Panel B presents the test of *whether the self-censoring explanation is more plausible than the difference-in-opinion explanation.* Panel C reports the average number of stocks in each portfolio across the sample period. At the end of each month, we first divide all stocks in the general sample into five groups based on dispersion in analysts' earnings forecasts. Dispersion in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. D1 (D5) includes stocks with the lowest (highest) dispersion. Institutional ownership is determined by index assignment, with stocks in the bottom of the Russell 1000 index labeled R1 and those in the top of the Russell 2000 index labeled R2. Stocks in R1 have lower institutional ownership than those in R2. We end up with 10 (2X5) portfolios. After being assigned to portfolios, stocks are held for one month. RaDb represents a stock selected from group Ra and Db. D1-D5 is the return of the hedge portfolio that holds a long position in stocks of D1 and a short position in stocks of D5. The monthly return (in percentage) of each portfolio is the equal-weighted average of the returns of all the stocks in the portfolio. We report returns in bold, including raw monthly returns (RAW), the CAPM alpha, alpha from the Fama-French three-factor model (FF3), and alpha from the Fama-French three-factor model augmented by the Carhart momentum factor (FF4). Newy-West t-statistics are reported. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

Panel A. Institutional Ownership and the Dispersion Effect

Raw Return	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
Low (R1)	**1.20**	**1.05**	**1.43**	**0.86**	**0.87**	**0.33**
t-stat	4.16	3.31	5.19	2.93	2.69	0.99
High (R2)	**1.44**	**1.04**	**1.12**	**0.91**	**0.68**	**0.77*****
t-stat	6.36	3.87	4.16	2.75	2.13	2.82

CAPM	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
Low (R1)	**0.78**	**0.67**	**1.00**	**0.44**	**0.47**	**0.31**
t-stat	2.65	2.06	3.51	1.53	1.43	0.91
High (R2)	**1.07**	**0.66**	**0.74**	**0.52**	**0.33**	**0.73*****
t-stat	4.32	2.35	2.59	1.51	1.02	2.64

FF3	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
Low (R1)	**0.74**	**0.71**	**1.00**	**0.38**	**0.46**	**0.28**
t-stat	2.55	2.09	3.67	1.22	1.37	0.81
High (R2)	**1.02**	**0.66**	**0.70**	**0.47**	**0.35**	**0.68****
t-stat	4.47	2.29	2.50	1.34	1.01	2.44

FF4	*Dispersion*					
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**	**D1-D5**
Low (R1)	**0.83**	**0.79**	**1.16**	**0.42**	**0.59**	**0.24**
t-stat	2.75	2.22	4.39	1.28	1.68	0.66
High (R2)	**1.10**	**0.76**	**0.74**	**0.53**	**0.34**	**0.76*** **
t-stat	4.31	2.51	2.46	1.45	0.94	2.61

Panel B. Test of Hypothesis 2 (*Self-Censoring*)

H_0 **: (**R2D1-R2D5 ≤ R1D1-R1D5**)**

H_A **:** *Hypothesis 2* **(**R2D1-R2D5>R1D1-R1D5**)**

	RAW	**CAPM**	**FF3**	**FF4**
(R2D1-R2D5)-(R1D1-R1D5**)**	**0.43**	**0.43**	**0.40**	**0.52**
p-value	0.08	0.09	0.11	0.06

Panel C. Average Number of Stocks in Each Portfolio

Observations	*Dispersion*				
Institutional Ownership	**D1**	**D2**	**D3**	**D4**	**D5**
Low (R1)	13	13	14	14	17
High (R2)	15	16	15	15	15

Table 7 **Institutional Ownership and the Dispersion Effect: The Russell Sample**

Panel A of this table presents the regression results from the following model:

$RET_{i,t+1} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$

$RET_{i,t+1} = \beta_0 + \gamma_1 DISP_{i,t} * High\_IO_{i,t} + \gamma_2 DISP_{i,t} + \gamma_3 High\_IO_{i,t} + \gamma_4 LOGMV_{i,t} + \gamma_5 LOGBM_{i,t} + \gamma_6 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$

for the Russell sample. The dependent variable *RET* is monthly stock return. *DISP*, *LOGMV*, *LOGBM*, and *MOM* are dispersion, log of market capitalization, log of book-to-market ratio, and momentum, as defined in Table 1. We run the regression separately for stocks with low institutional ownership (I1) and for stocks with high institutional ownership (I2). To test the difference of the coefficients of *DISP* across the two samples, we run a pooled regression with *High IO* as a dummy for the group of stocks with high IO in Column (3). We include month fixed effects in each regression. Standard errors are clustered at both the month and the stock level. t-stats are in parentheses. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively. Panel B reports the left-tailed test for $\gamma_1 < 0$, implied by the self-censoring hypothesis.

Panel A. Panel Regression Results

	Russell Sample		
	(1)	(2)	(3)
	Low IO (R1)	High IO (R2)	Combined
DISP	**0.011**	**-0.210*** **	**0.019**
	(0.10)	**(-2.64)**	**(0.17)**
DISP*High IO			**-0.221***
			(-1.77)
High IO			-0.012
			(-0.09)
LOGBM	0.443***	0.224	0.361***
	(3.29)	(1.58)	(3.05)
LOGMV	0.29	-0.145	0.159
	(1.43)	(-0.42)	(0.84)
MOM	0.727**	0.481**	0.552***
	(2.37)	(2.49)	(2.79)
Intercept	11.177***	13.428***	11.451***
	(5.12)	(3.43)	(5.49)
Time Fixed Effects	Yes	Yes	Yes
Adjusted R2	0.173	0.172	0.17
Observations	17,764	20,115	37,879

Panel B. Test of Hypothesis 2 (*Self-Censoring*)

H_0**:** $\gamma_1 \geq 0$

H_0**:** *Hypothesis 2* **(** $\gamma_1 < 0$ **)**

Coefficients on DISP*High IO (γ_1 **)**	**-0.221**
p-value	0.049

Table 8 **Institutional Ownership, Forecast Dispersion and Forecast Bias**

This table presents average forecast bias of analysts across institutional ownership and forecast dispersion portfolios. Panel A is for the Russell sample, while Panel B is for the general sample. Forecast bias (*BIAS*) is defined as analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by the current price of the stock. At the end of each month, we first divide all stocks in the Russell (General) sample into five groups based on forecast dispersion. D1 (D5) includes stocks with the lowest (highest) dispersion. Institutional ownership is determined by index assignment for the Russell sample, with stocks in the bottom of the Russell 1000 index labeled R1 and those in the top of the Russell 2000 index labeled R2. Stocks in R1 have lower institutional ownership than those in R2. For the general sample, stocks are independently sorted based on institutional ownership into 5 groups from I1 to I5. Stocks in I1 have the lowest institutional ownership. We end up with 10 (2X5) portfolios in the Russell sample and 25 (5X5) portfolios in the general sample. For each portfolio, we first calculate the monthly median of *BIAS* and then present the time-series average of the median. *DIFF* is the difference in *BIAS* between high dispersion and low dispersion portfolios. *DID* is the difference in *DIFF* between low and high institutional ownership groups. The null hypothesis (H0) is *DID*=0.

Panel A: The Russell Sample

Dispersion	D1 (Low)	D2	D3	D4	D5 (High)	DIFF
R1 (Low)	0.11%	0.14%	0.26%	0.40%	0.94%	0.83%
R2 (High)	0.06%	0.13%	0.29%	0.53%	1.11%	1.05%
					DID	**0.22%**
					H0	DID=0
					p-value	0.009

Panel B: The General Sample

Dispersion	D1 (Low)	D2	D3	D4	D5 (High)	DIFF
I1 (Low)	0.13%	0.18%	0.29%	0.58%	1.63%	1.50%
I2	0.09%	0.11%	0.23%	0.54%	1.52%	1.43%
I3	0.04%	0.09%	0.24%	0.52%	1.31%	1.27%
I4	0.03%	0.09%	0.24%	0.44%	1.09%	1.05%
I5 (High)	0.01%	0.10%	0.18%	0.37%	1.06%	1.05%
					DID	**-0.45%**
					H0	DID=0
					p-value	0.000

Table 9 **Institutional Ownership, Forecast Dispersion and Forecast Bias**

This table reports the results of the following regressions:

$$BIAS_{i,t} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$$

$$BIAS_{i,t} = \beta_0 + \beta_1 DISP_{i,t} * High\_IO_{i,t} + \beta_2 DISP_{i,t} + \beta_3 High\_IO_{i,t} + \beta_4 LOGMV_{i,t} + \beta_5 LOGBM_{i,t} + \beta_6 MOM_{i,t} + \mu_{i,t} + \varepsilon_{i,t+1}$$

for the Russell sample (Panel A) and the general sample (Panel B). The dependent variable *BIAS* is forecast bias. It is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by the current price of the stock. *DISP*, *LOGMV*, *LOGBM*, and *MOM* are dispersion, log of market capitalization, log of book-to-market ratio, and momentum, as defined in Table 1. We run the regression separately for stocks with low institutional ownership and for stocks with high institutional ownership. To test the difference of the coefficients of *DISP* across the two samples, we run a pooled regression with *High IO* as a dummy for the group of stocks with high IO in Column (3). We include month fixed effects in each regression. Standard errors are clustered at both the month and stock level. t-stats are in parentheses. ***, **, and * correspond to significance at 1%, 5%, and 10%, respectively.

Panel A. Panel Regression Results: Russell Sample

	Russell Sample		
	(1)	(2)	(3)
	Low IO	High IO	Combined
DISP	**0.003****	**0.013*****	**0.003****
	(2.48)	**(3.19)**	**(2.33)**
DISP*High IO			**0.010****
			(2.40)
High IO			-0.001
			(-0.47)
LOGBM	0.001	0.010***	0.006***
	(0.51)	(3.35)	(3.17)
LOGMV	-0.009	-0.013*	-0.010*
	(-1.26)	(-1.82)	(-1.91)
MOM	-0.019***	-0.004*	-0.010***
	(-4.16)	(-1.70)	(-3.79)
Intercept	0.140*	0.242***	0.181***
	(1.85)	(2.77)	(3.00)
Time Fixed Effects	Yes	Yes	Yes
Adjusted R2	0.021	0.058	0.029
Observations	17,189	19,447	36,636

Panel B. Panel Regression Results: General Sample

	General Sample		
	(1)	(2)	(3)
	Low IO	High IO	Combined
DISP	**0.009*** **	**0.003*** **	**0.009*** **
	(8.06)	**(3.18)**	**(8.15)**
DISP*High IO			**-0.006*** **
			(-4.67)
High IO			-0.001
			(-1.22)
LOGBM	0.005***	0.004***	0.004***
	(4.83)	(7.56)	(7.04)
LOGMV	-0.004***	-0.002***	-0.003***
	(-9.05)	(-5.74)	(-11.12)
MOM	-0.019***	-0.014***	-0.017***
	(-6.40)	(-8.89)	(-8.49)
Intercept	0.111***	0.078***	0.094***
	(12.21)	(12.30)	(17.16)
Time Fixed Effects	Yes	Yes	Yes
Adjusted R2	0.039	0.051	0.042
Observations	103,050	126,968	230,018